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XVIII. *A Table for facilitating the Computations relative to Suspension Bridges.**By* DAVIES GILBERT, *Esq. V.P.R.S.*

Read, May 19, 1831.

THE following Table is supplementary to those accompanying the paper “On the Mathematical Theory of Suspension Bridges,” printed in the Philosophical Transactions for 1826. It is deduced from the first Table there given, by the plain operations of common arithmetic; but this admits of a far more ready application than the former, to all cases of practical investigation.

The first column contains the deflections or versed sines of the curve, expressed in fractional parts of the double ordinate or Span. It is therefore  $2y$  divided by  $x$ , and their reciprocals are added under each.

The second column gives the lengths of the chain without alteration from the former Table, except that the double ordinate or span is taken as the unit.

The third column has the tensions of the chain at the middle points or apices of the curve, when the tensions are least; taking the weight of the chain, or that weight augmented by the adjunct weight, or with the adventitious weight also, as unity. The numbers are obtained by dividing  $a$  by  $2z$ .

The fourth column gives the tensions in a similar manner for the extremities of the chain, where they are greatest; and it is made by dividing  $T$  by  $2z$ .

The fifth column gives the angles made by the chains at their extremities with the plane of the horizon, being the complements of those in the former Table.

As all these numbers are immediately derived from an existing Table, there would have been much additional trouble, and without any adequate advantage, in making the denominators of the fractions in the first column or their reciprocals (the decimal fractions), to succeed each other by equal differences. And I have thought it unnecessary to extend the Table further in either direction; since no deflection is likely to be so great as a seventh of the span;

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and in the event of a short and light bridge being constructed with a deflection less than one part in forty, the columns may be continued with an accuracy quite sufficient, by taking the direct proportion of the denominators for columns three and four, and the inverse proportion for column five. The numbers in column two may be neglected, as not sensibly differing, in such a case, from unity, or they may be found in the Table from which this has been derived.

Deflections or Versed Sines.	Length of the Chains.	Tensions at the Middle Points.	Tensions at the Extremities.	Angles with the Horizon at the Extremities.
One in 39.97 .02502	1.00166	4.992	5.017	5° 43'
39.17 .02553	1.00173	4.892	4.917	5 50
38.37 .02607	1.00181	4.791	4.817	5 58
37.57 .02662	1.00189	4.691	4.718	6 5
36.76 .02720	1.00196	4.591	4.618	6 13
35.96 .02781	1.00206	4.491	4.519	6 21
35.16 .02844	1.00215	4.391	4.419	6 30
34.36 .02910	1.00225	4.290	4.319	6 39
33.56 .02980	1.00236	4.190	4.220	6 48
32.76 .03053	1.00247	4.090	4.121	6 58
31.96 .03129	1.00260	3.989	4.021	7 9
31.16 .03210	1.00273	3.889	3.921	7 22
30.36 .03294	1.00288	3.789	3.822	7 31
29.56 .03384	1.00304	3.689	3.723	7 43
28.75 .03478	1.00322	3.588	3.623	7 56
27.95 .03577	1.00340	3.488	3.524	8 9
27.15 .03683	1.00360	3.388	3.425	8 24
26.35 .03795	1.00383	3.287	3.325	8 39
25.55 .03914	1.00407	3.187	3.226	8 55
24.75 .04041	1.00434	3.087	3.126	9 12

TABLE (Continued).

Deflections or Versed Sines.	Length of the Chains.	Tensions at the Middle Points.	Tensions at the Extremities.	Angles with the Horizon at the Extremities.
One in 23.95	1.00463	2.986	3.027	9° 30'
.04176				
23.14	1.00496	2.886	2.928	9 50
.04321				
22.34	1.00532	2.785	2.830	10 11
.04476				
21.54	1.00568	2.685	2.731	10 33
.04642				
20.74	1.00617	2.584	2.632	10 57
.04823				
19.93	1.00668	2.483	2.533	11 23
.05017				
19.13	1.00725	2.383	2.435	11 51
.05227				
18.33	1.00789	2.282	2.337	12 22
.05456				
17.52	1.00863	2.181	2.238	12 55
.05706				
16.72	1.00947	2.080	2.140	13 31
.05980				
15.92	1.01045	1.979	2.041	14 11
.06282				
15.11	1.01158	1.878	1.943	14 54
.06617				
14.31	1.01291	1.777	1.846	15 43
.06989				
13.50	1.01448	1.676	1.749	16 28
.07406				
12.70	1.01635	1.574	1.652	17 37
.07876				
11.89	1.01862	1.473	1.555	18 45
.08411				
11.08	1.02139	1.371	1.469	20 2
.09024				
10.27	1.02484	1.269	1.363	21 31
.09734				
9.47	1.02893	1.166	1.269	23 12
.10563				
8.65	1.03474	1.063	1.174	25 11
.11559				
7.84	1.04219	0.960	1.083	27 31
.12762				
7.00	1.05343	0.854	0.990	30 20
.14280				